



IJMHR

International Journal of Medicine & Health Research

www.internationalmedicalpublishing.com



Research Article

Section: General Surgery

A Clinical Study of Complicated Groin Hernia & Its Management in a Tertiary Care Centre

Udhab Mandal^{1*}, Bijit Gogoi² & Saddam Hussain¹

¹Department of General Surgery, Jorhat Medical College & Hospital, Jorhat, Assam, India

²Department of General Surgery, Pragjyotishpur Medical College & Hospital, Guwahati, Assam, India

HIGHLIGHTS

- Older males predominantly affected
- Obstructed inguinal hernia predominated
- Early surgery improved outcomes
- Bowel viability preserved frequently
- Low mortality with prompt management

Key Words:

Groin hernia
Complicated hernia
Intestinal obstruction
Strangulation
Emergency surgery

ABSTRACT

Introduction: Complicated groin hernia is a common surgical emergency associated with intestinal obstruction, strangulation, bowel ischaemia, resection, postoperative morbidity, and mortality. Early recognition and timely operative management are essential to prevent bowel loss and improve outcomes. **Aim & Objective:** To evaluate the clinical profile and management of complicated groin hernia in a tertiary care centre, including presenting features, radiological findings, operative procedures, bowel viability, perioperative complications, and short-term outcomes. **Materials & Methods:** This hospital-based cross-sectional study was conducted in the Department of General Surgery at Jorhat Medical College and Hospital over a period of 1 year. Sixty patients aged 12 years or above with clinically and radiologically diagnosed complicated groin hernia were included. Demographic data, clinical findings, investigations, operative details, postoperative complications, and outcomes were recorded and analysed using descriptive statistics. **Results:** Of 60 patients, 55 (92%) were male and 5 (8%) were female, with most patients aged over 50 years. Inguinal hernia predominated in 55 (92%) cases, while femoral hernia occurred in 5 (8%). Obstruction was the most common presentation in 35 patients, followed by irreducibility in 15 and strangulation in 5. Swelling and pain were universal symptoms. Hernial contents were viable in 50 patients and non-viable in 10. Obstruction release with anatomical repair was performed in 40 patients; mesh repair and bowel resection with anastomosis were each required in 7. Postoperative pain occurred in 34 patients, seroma in 18, wound gaping in 4, and one patient died. **Conclusion:** Complicated groin hernia mainly affected older males and commonly presented as obstructed right-sided inguinal hernia. Early diagnosis, prompt resuscitation, and appropriate surgery reduced bowel resection, mortality, and recurrence during short-term follow-up.



* Corresponding Author: Udhab Mandal, e-mail: mandaludhab1994@gmail.com

Article History: Received 09 June 2026; Received in Revised form 26 July 2026; Accepted 02 August 2026

How To Cite: Udhab Mandal, Bijit Gogoi & Saddam Hussain. A Clinical Study of Complicated Groin Hernia & Its Management in a Tertiary Care Centre. *IJMHR: International Journal of Medicine & Health Research*. 2026;14(2):1-9. DOI: <https://doi.org/10.71393/q3d4je18>

This publication is licensed under CC-BY 4.0. Copyright © 2026 The Authors. Published by International Medical Publishing Group.

INTRODUCTION

Groin hernia is a common condition in general surgical practice and includes inguinal and femoral hernias. It develops when abdominal contents protrude through a defect or weak area in the lower abdominal wall [1]. Inguinal hernias constitute the majority and occur predominantly in men, whereas femoral hernias are less frequent, more common in women, and carry a greater risk of complications. Groin hernia repair is among the most frequently performed surgical procedures worldwide, with more than 20 million operations undertaken annually [2]. Although age-standardized rates have declined in some regions, the absolute burden has increased because of population growth and ageing, with India contributing substantially to the global caseload [3].

An uncomplicated groin hernia may remain reducible and present as a painless or mildly uncomfortable swelling [4]. A complicated groin hernia refers to an acutely irreducible hernia associated with incarceration, intestinal obstruction, strangulation, gangrene, or perforation. In incarceration, the contents become trapped within the hernial sac and cannot be returned to the abdominal cavity [5]. Compression at the hernial neck first compromises venous and lymphatic drainage, producing oedema and further constriction. Continued pressure may reduce arterial inflow, leading to ischaemia, necrosis, perforation, peritonitis, sepsis, and death. The transition from obstruction to strangulation may occur rapidly, making early recognition and prompt surgical decision-making essential [6].

Complicated groin hernias usually present with a painful, tense, irreducible swelling in the inguinal or upper thigh region [7]. Associated features include abdominal pain, vomiting, distension, constipation or obstipation, fever, tachycardia, dehydration, and systemic toxicity. Local tenderness, erythema, warmth,

absent cough impulse, and skin changes increase suspicion of strangulation [8]. Elderly patients, women with an occult femoral hernia, and individuals with obesity or altered mental status may present atypically, resulting in delayed diagnosis. Femoral hernia, female sex, advanced age, major comorbidity, intestinal obstruction, peritonitis, and delayed presentation have been associated with increased bowel resection, morbidity, and mortality. Emergency groin hernia repair has substantially higher mortality than elective repair, particularly among patients with femoral hernia or those requiring bowel resection [9]. Diagnosis is primarily clinical, and careful examination of both groins is important in every patient presenting with intestinal obstruction. Laboratory investigations help assess dehydration, electrolyte imbalance, infection, organ dysfunction, and the physiological consequences of strangulation, but no isolated marker reliably excludes bowel ischaemia [10]. Ultrasonography is useful when the swelling is small, clinically uncertain, or difficult to characterize. A non-reducible aperistaltic bowel loop, fluid within the sac, bowel-wall thickening, & reduced Doppler flow may suggest incarceration or strangulation [11]. Contrast-enhanced computed tomography is valuable in uncertain cases because it can identify the hernia site, bowel obstruction, reduced bowel enhancement, pneumatosis, perforation, and alternative causes of acute abdomen. Imaging should not delay operation when strangulation is clinically evident [12].

Initial management focuses on rapid resuscitation and preparation for definitive surgery. The patient should be kept nil by mouth, intravenous access secured, and fluid and electrolyte deficits corrected [13]. Nasogastric decompression, urinary catheterization, analgesia, antibiotics, and thromboprophylaxis are used according to the patient's condition. Gentle manual

Mechanism of Complicated Groin Hernia: From Incarceration to Strangulation

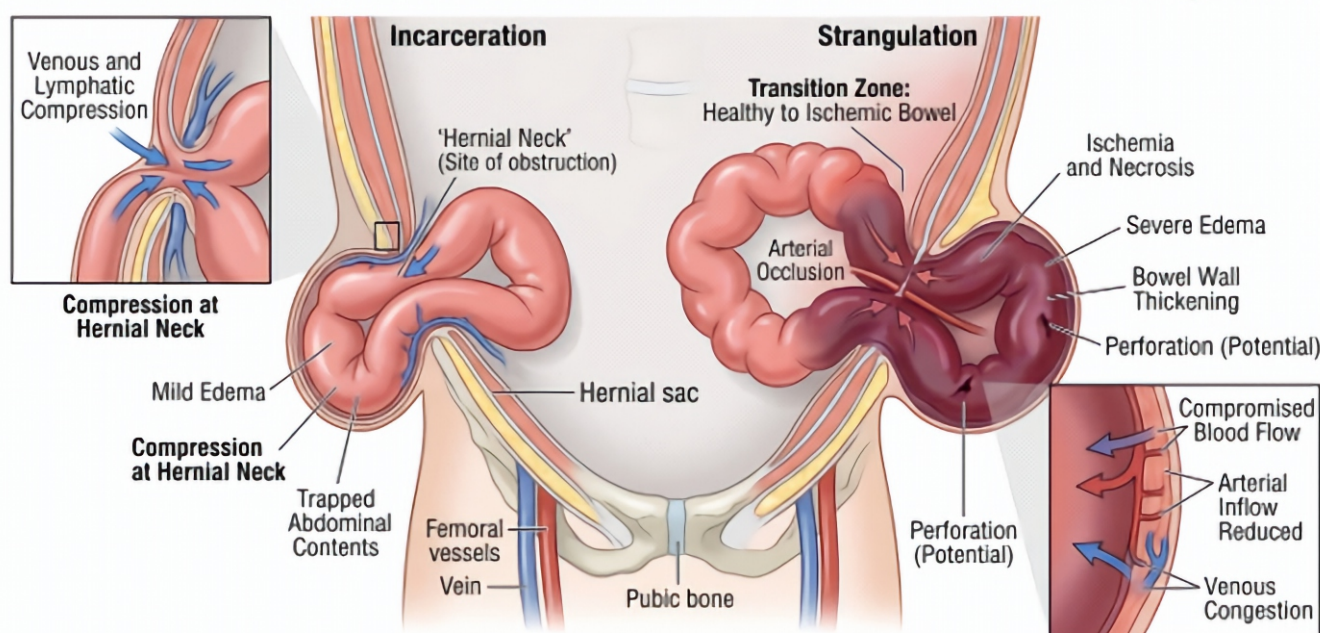


Figure 1: Mechanism of Complicated Groin Hernia Progression from Incarceration to Strangulation.

reduction may be considered only in selected patients with an acute irreducible hernia when strangulation is not suspected. Forceful reduction is avoided because devitalized bowel may be pushed into the abdomen while persistent ischaemia remains unrecognized. Patients with suspected strangulation, peritonitis, systemic toxicity, or failed reduction require urgent operative exploration. Early surgical intervention is associated with a reduced requirement for bowel resection [14].

The operative objectives are to release the constriction, reduce the contents, assess bowel viability, resect non-viable intestine when necessary, control contamination, and repair the defect. Open anterior repair remains widely used because it provides rapid access & is familiar to emergency surgeons. Laparoscopic transabdominal preperitoneal repair can permit abdominal inspection, assessment of bowel viability, reduction under vision, and detection of an occult femoral or contralateral defect. Recent evidence indicates that, in selected patients and experienced hands, emergency laparoscopic repair may shorten hospital stay and reduce postoperative complications compared with open surgery. Approach selection depends on haemodynamic stability, bowel distension, contamination, previous surgery, anaesthetic risk, and available expertise [15].

The use of prosthetic mesh in complicated groin hernia remains an important consideration. Mesh repair reduces recurrence and is generally accepted in clean emergency operations and many clean-contaminated cases [15]. Concern persists when gross contamination, bowel perforation, or established infection is present because mesh infection may result in chronic sepsis, reoperation, or mesh removal. The decision between mesh and tissue repair should therefore be individualized according to operative findings, contamination, bowel resection, patient factors, and institutional protocol. Postoperative outcomes are influenced by delayed presentation, advanced age, comorbidity, sepsis, intestinal resection, wound infection, respiratory complications, and prolonged hospitalization [6].

Tertiary care centres manage complex groin hernias, including delayed, recurrent, obstructed, strangulated, and diagnostically uncertain cases. With advanced imaging, anaesthesia, intensive care, bowel resection, minimally invasive surgery, and multidisciplinary support, they enable comprehensive treatment. This study will evaluate patient profiles, presentation, operative findings, procedures, complications, recurrence, and mortality to improve diagnosis, planning, and outcomes while reducing bowel loss and morbidity. **Figure 1. Mechanism of Complicated Groin Hernia Progression.** Schematic showing progression from incarceration with venous obstruction and bowel edema to strangulation, resulting in arterial compromise, ischemia, necrosis, and potential bowel perforation.

The study aims to evaluate the clinical profile and management of complicated groin hernia in a tertiary care centre. Its objectives are to assess presenting symptoms and clinical findings, examine relevant radiological findings & establish the diagnosis, and analyse the operative & perioperative management

approaches used, including procedures required for obstruction, strangulation, bowel viability, and associated complications during hospitalization.

MATERIAL & METHODS

This cross-sectional, hospital-based study was conducted in the Department of General Surgery, Jorhat Medical College and Hospital, over one year. Sixty patients aged 12 years or above with clinically and radiologically diagnosed complicated groin hernia, presenting to the emergency department or Surgery OPD, were included through simple random sampling. After ethical approval and written informed consent, detailed history, clinical examination, laboratory investigations, radiological findings, operative procedures, intraoperative findings, postoperative course, complications, and treatment outcomes were recorded in a pretested proforma. Patients were followed until discharge and three weeks thereafter. Data were entered in Microsoft Excel and analysed using descriptive statistics.

RESULTS

A marked male predominance was observed, with 55 males (92%) and only 5 females (8%), producing a male-to-female ratio of 11:1. Complicated groin hernia occurred most frequently among patients aged 51–60 years (33%), closely followed by those aged above 61 years (32%). In contrast, the lowest proportion was recorded in the 13–30-year age group (5%). These findings indicate that complicated groin hernia predominantly affected older male patients in the study population. Inguinal hernia was the predominant type, occurring in 55 patients (92%), whereas femoral hernia was identified in only 5 patients (8%). This marked difference indicates that complicated groin hernias primarily involved the inguinal region in the study population. The low frequency of femoral hernia suggests a comparatively smaller contribution to the overall complicated cases. Therefore, clinical assessment and operative planning should particularly emphasize complications associated with inguinal hernias (**Table 1**). Obstruction was the most common presentation of complicated groin hernia, observed in 35 patients, indicating that bowel obstruction constituted the principal clinical complication. Irreducibility was the second most frequent presentation, affecting 15 patients. Strangulation was least common, occurring in 5 patients, but represented the most severe form because of the risk of compromised bowel viability. These findings emphasize the need for early diagnosis and urgent surgical management to prevent progression from obstruction or irreducibility to strangulation (**Figure 2**). Right-sided inguinal hernia was the most frequent location, accounting for 31 cases, followed by left-sided inguinal hernia with 24 cases. Obstruction predominated in both inguinal locations, with 20 right-sided and 15 left-sided cases, whereas irreducibility occurred in 8 and 7 cases, respectively. Femoral hernias were uncommon, comprising only 3 right-sided and 2 left-sided cases. Overall, complicated groin hernias predominantly involved the

inguinal region, with a slight right-sided predominance and obstruction as the leading complication (**Table 2**). Swelling and pain were present in all 60 patients, identifying them as the universal presenting symptoms of complicated groin hernia. Vomiting was reported in 48 patients and constipation in 43, reflecting the frequent occurrence of intestinal obstruction. Abdominal distension and obstipation were less common, affecting 14 and 11 patients, respectively, while fever was observed in only 8 patients. These findings indicate that complicated groin hernia commonly presented with a painful swelling accompanied by features of bowel obstruction (**Figure 3**). The duration of swelling was most commonly 1–3 years, observed in 32 patients, indicating that many patients had a prolonged history before developing complications. Swelling for less than one year was reported in 16 patients, while 12 patients had symptoms for more than three years. This distribution suggests that complicated groin hernia frequently developed after delayed presentation or prolonged neglect of the swelling. Early evaluation and elective repair may therefore help prevent obstruction, strangulation, and emergency surgery (**Table 3**). Most patients presented to the emergency ward within 24–48 hours, accounting for 27 cases, followed by 23 patients who arrived within 24 hours. Delayed presentation beyond 48 hours was observed in 10 patients, representing the smallest group. This pattern indicates that although most patients sought emergency care within two days, a considerable proportion experienced delayed hospital presentation. Such delay may increase the risk of bowel compromise, strangulation, resection, and postoperative morbidity (**Figure 4**). Absence of cough impulse, irreducible swelling, and local tenderness were present in all 60 patients (100%), confirming the clinically complicated nature of the hernias. Visible peristalsis was observed in 38 patients (64%), indicating frequent intestinal obstruction within

the hernial sac. Decreased or absent bowel sounds occurred in only 5 patients (8%), suggesting advanced obstruction or impaired bowel activity in a smaller subgroup. Overall, irreducibility and tenderness were the most consistent clinical signs, while altered bowel sounds were relatively uncommon (**Table 4**). Viable hernial contents were observed in 50 patients, whereas non-viable contents were found in 10 patients. Among viable contents, intestine alone was most common in 22 cases, followed by omentum alone in 14 and combined omentum with small intestine in 13 cases. Among non-viable contents, intestine alone was again predominant in 5 cases, followed by omentum alone in 3 and combined omentum with small intestine in 2 cases. These findings indicate that intestinal involvement was the principal sac content and the most frequent tissue associated with loss of viability (**Table 5**). Obstruction release with anatomical repair was the most frequently performed procedure, accounting for 40 of the 60 cases. Obstruction release with mesh repair and bowel resection with anastomosis and herniorrhaphy were each required in 7 patients. Obstruction release combined with omentectomy and anatomical repair was performed in the remaining 6 cases. These findings indicate that most complicated groin hernias were managed without bowel resection, while a smaller proportion required removal of non-viable bowel or omentum (**Figure 5**).

Postoperative pain was the most frequent complication, affecting 34 patients (56%), followed by seroma in 18 patients (30%). Wound gaping occurred in 4 patients (7%), indicating comparatively limited wound-related morbidity. Only 3 patients (5%) experienced no postoperative complication, while one death (2%) was recorded. These findings demonstrate substantial postoperative morbidity, predominantly involving pain and seroma, with a relatively low mortality rate (**Table 6**).

Table 1: Different types of groin hernia

Type of hernia	Frequency	Percent
Femoral	5	8.0
Inguinal	55	92.0
Total	60	100.0

PRESENTATION OF COMPLICATED GROIN HERNIA

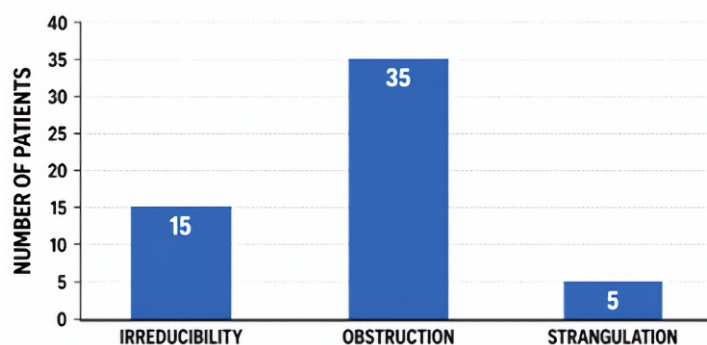
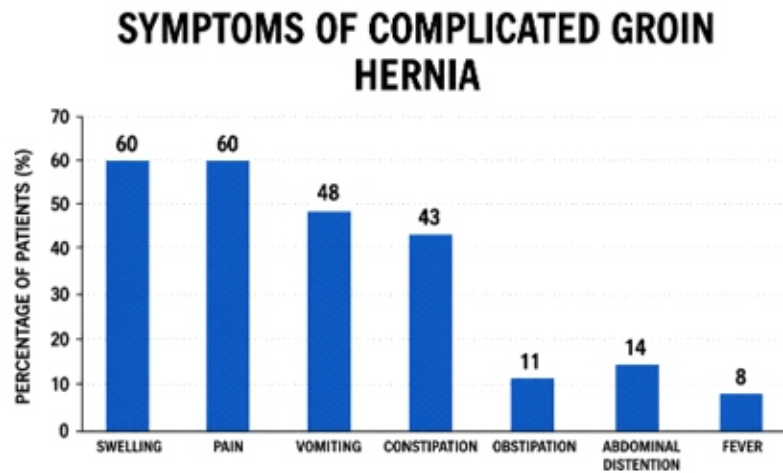


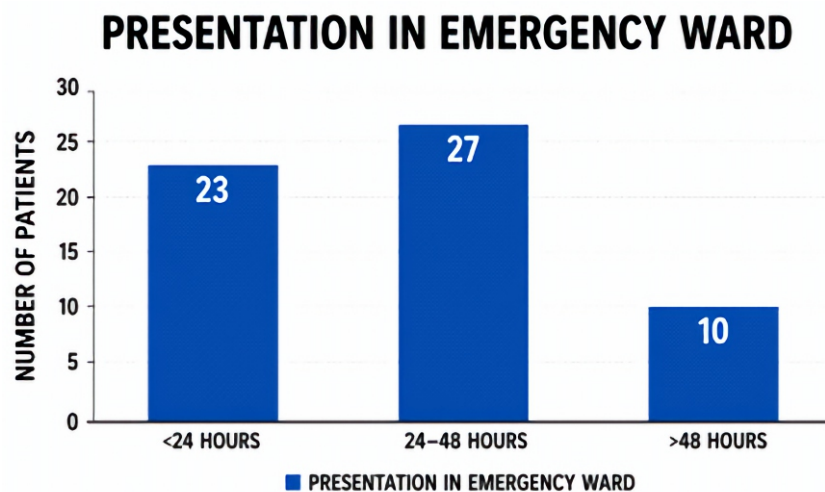
Table 2: Bar diagram showing different presentations of complicated groin hernia

Table 2: Different locations of complicated groin hernia

Types	Side	Irreducibility	Obstruction	Strangulation
Inguinal	Right	8	20	3
Inguinal	Left	7	15	2
Femoral	Right	1	1	1
Femoral	Left	0	1	1

**Figure 2: Bar diagram showing different symptoms of complicated groin hernia****Table 3: Durations of swelling of complicated groin hernia**

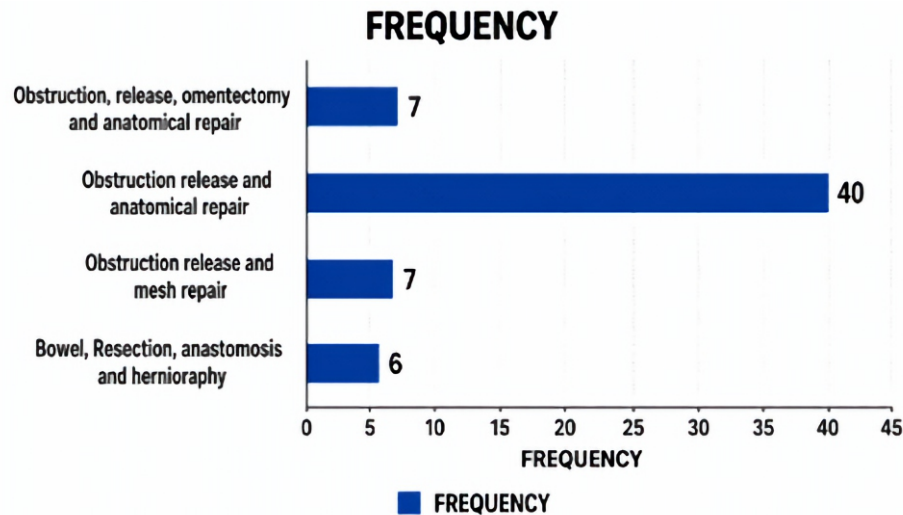
Duration of Swelling	Number
<1 year	16
1–3 years	32
>3 years	12

**Figure 4: Bar diagram showing different times of presentation to the emergency ward. The majority of the patients presented to the emergency ward between 24 and 48 hours.****Table 4: Different sign of complicated groin hernia**

Clinical Findings	No. of Cases	Percentage (%)
No impulse on coughing	60	100
Irreducible swelling	60	100
Local tenderness	60	100
Visible peristalsis	38	64
Decreased or absent bowel sounds	5	8

Table 5: Contents of Complicated Groin Hernia

Viability	No. of Cases	Content of Sac	Percentage
Viable	50	Only omentum	14
		Omentum and small intestine	13
		Only intestine	22
		Colon	0
		Omentum and colon	1
Non-viable	10	Only omentum	3
		Omentum and small intestine	2
		Only intestine	5

**Figure 5: Bar diagram showing different procedures done in complicated groin hernia****Table 6: Different Postoperative Complications of Complicated Groin Hernia**

Complications	No. of Cases	Frequency (%)
None	3	5.0
Pain	34	56.0
Seroma	18	30.0
Wound gaping	4	7.0
Death	1	2.0

DISCUSSION

The clinical pattern observed in our study demonstrates that complicated groin hernia predominantly involved inguinal hernias, which constituted 55 cases (92%), whereas femoral hernias accounted for 5 cases (8%). This distribution resembled Hariprasad and Teerthanath Srinivas [16], who reported 38 inguinal and two femoral hernias among 40 complicated cases, confirming that inguinal hernias remain the principal source of complicated presentations. Obstruction was the commonest presentation, affecting 35 patients (64%), followed by irreducibility in 15 (27%) and strangulation in 5 (9%). Hariprasad and Teerthanath Srinivas [16] similarly found incarceration to be predominant, although their strangulation rate of 30% was higher than ours. Right-sided disease was more frequent across complicated inguinal and femoral hernias. Sanjay Prakash et al. [17] also documented greater right-sided involvement, while Lawrence S. Fallis [18] reported that right-sided hernias exceeded left-sided hernias in a ratio of 6:5.

Clinically, every patient presented with groin swelling and pain; vomiting occurred in 48 (80%), constipation in 43 (72%), abdominal distension in 14 (24%), obstipation in 11 (18%) and fever in 8 (12%). These findings were consistent with Hariprasad and Teerthanath Srinivas [17], who described pain, vomiting, constipation and abdominal distension as common manifestations, and Rabin Pratap Shah et al. [19], who observed pain and irreducible swelling in all patients. A swelling duration of one to three years was present in 32 patients, while 16 had swelling for less than one year and 12 for more than three years. Hariprasad and Teerthanath Srinivas [17] likewise found that hernias commonly persisted for one to two years before complication. Only 23 patients reached the emergency ward within 24 hours, whereas 27 presented between 24 & 48 hours & 10 after 48 hours. Akinci et al. [20] identified delayed admission as a determinant of unfavourable outcome, while Rai et al. [19] related delayed presentation & prolonged irreducibility to impaired sac-content viability and increased morbidity.

Examination revealed absent cough impulse, irreducibility and local tenderness in all 60 patients, visible peristalsis in 38 (64%) and absent or decreased bowel sounds in 5 (8%). Bekoe et al. [21] concluded that clinical findings alone could not reliably distinguish viable from non-viable incarcerated contents, supporting timely operative exploration. At surgery, 50 patients had viable contents and 10 had non-viable contents; intestine was the commonest sac content. Hariprasad and Teerthanath Srinivas [17] reported viable bowel in 77.5%, while Rabin Pratap Shah et al. [22] identified small intestine as the commonest content.

Obstruction release with anatomical repair was performed in 40 patients (67%); mesh repair and bowel resection with anastomosis were each required in 7 (12%), while 6 (9%) underwent omentectomy with anatomical repair. Kulah et al. [23] reported bowel resection in 6%, supporting selective resection when viability is lost. Postoperatively, pain occurred in 34 patients (56%), seroma in 18 (30%), wound gaping in 4 (7%) and death in 1 (2%). Hariprasad and Teerthanath Srinivas [16] reported wound infection and scrotal seroma as leading complications, while Rabin Pratap Shah et al. [22] also recorded 2% mortality. The absence of recurrence indicates satisfactory short-term effectiveness of prompt surgical repair and perioperative care.

CONCLUSION

This study concludes that complicated groin hernia predominantly affected older males and was mainly inguinal, right-sided, and obstructed in presentation. Painful irreducible swelling, vomiting, and constipation were the principal clinical features, while delayed presentation was common. Most hernial contents remained viable, allowing obstruction release with anatomical repair in the majority, whereas bowel resection was required only in selected patients with non-viable intestine. Postoperative morbidity was chiefly due to pain and seroma, with low mortality and no short-term recurrence. Early recognition, timely referral, prompt resuscitation, and appropriate surgical intervention are essential to reduce bowel loss, complications, and death among affected patients.

LIMITATIONS & FUTURE PERSPECTIVES

The study was limited by its single-centre design, relatively small sample size, and short duration, which may restrict generalizability. Future research could focus on multicenter studies with larger cohorts to validate findings, evaluate long-term outcomes, and explore innovative diagnostic and management strategies for appendicular perforation, improving patient prognosis and reducing complications.

CLINICAL SIGNIFICANCE

The clinical significance of this study lies in its potential to bridge the gap between research findings and practical healthcare applications. It emphasizes the importance of translating scientific observations into meaningful improvements in patient care, diagnosis, and treatment outcomes. By highlighting real

world relevance, the study contributes to evidence based medical practice and supports informed clinical decision making. Ultimately, the findings aim to enhance patient quality of life, optimize therapeutic strategies, and promote better disease management in clinical settings.

ABBREVIATIONS

CGH: Complicated Groin Hernia

IH: Inguinal Hernia

FH: Femoral Hernia

IO: Intestinal Obstruction

USG: Ultrasonography

CT: Computed Tomography

BT: Bowel Ischaemia

RA: Resection and Anastomosis

POD: Postoperative Day

SSI: Surgical Site Infection

AUTHOR INFORMATION

Dr. Udhab Mandal: Post Graduate Trainee

Dr. Bijit Gogoi: Associate Professor

Dr. Saddam Hussain: Post Graduate Trainee

AUTHOR CONTRIBUTIONS

All authors significantly contributed to the study conception and design, data acquisition, or data analysis and interpretation. They participated in drafting the manuscript or critically revising it for important intellectual content, consented to its submission to the current journal, provided final approval for the version to be published, and accepted responsibility for all aspects of the work. Additionally, all authors meet the authorship criteria outlined by the International Committee of Medical Journal Editors (ICMJE) guidelines.

ACKNOWLEDGEMENT

The authors sincerely acknowledge the seniors of the Department of General Surgery, Jorhat Medical College & Hospital, Jorhat, Assam, India. We are grateful to our college for providing the necessary resources to carry out this work. We also extend our heartfelt thanks to our colleagues and technical staff for their valuable assistance during the study.

CONFLICT OF INTEREST

Authors declared that there is no conflict of interest.

FUNDING

None

ETHICAL APPROVAL & CONSENT TO PARTICIPATE

All necessary consent & approval was obtained by authors.

CONSENT FOR PUBLICATION

All necessary consent for publication was obtained by authors.

DATA AVAILABILITY

All data generated and analyzed are included within this research article. The datasets utilized and/or analyzed in this study can be obtained from the corresponding author upon a reasonable request.

USE OF ARTIFICIAL INTELLIGENCE (AI) & LARGE LANGUAGE MODEL (LLM)

The authors confirm that no AI & LLM tools were used in the writing or editing of the manuscript, and no images were altered or manipulated using AI & LLM.

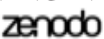
AUTHOR'S NOTE

This article serves as an important educational tool for the scientific community, offering insights that may inspire future research directions. However, they should not be relied upon independently when making treatment decisions or developing public health policies.

PUBLISHER'S NOTE

All statements made in this article are the sole responsibility of the authors and do not necessarily reflect the views of the publisher, editors, or reviewers. The journal maintains a neutral stance regarding jurisdictional claims in institutional affiliations presented in published work.

ARCHIVING INFORMATION

-  zenodo
- Self-archiving on Google and Amazon Web Services (AWS) cloud servers, as well as on three dedicated in-house servers
- PKP Preservation Network

MANAGING & PUBLISHING EDITOR

Dr. Vinay Kumar Yadav^{1,2,3}

¹CSIR-Indian Institute of Toxicology Research (IITR), Lucknow, India

²Academy of Scientific and Innovative Research (AcSIR), Ghaziabad, U.P., India

³Biological E Ltd, Hyderabad, Telangana, India

HANDLING EDITOR

Dr. Karan Singh Saini^{1,2,3}

¹Ph.D. in Cancer Research from CDRI-JNU New Delhi, India

& ²Post-Doctoral Fellow from University of Illinois at Chicago, USA

³Department of Zoology, P.M. College of Excellence, Government Postgraduate College in Sheopur, Madhya Pradesh, India

REFERENCES

- Rosenberg J, Baig S, Chen DC, Derikx J. Groin hernia. *Nat Rev Dis Primers*. 2025;11(1):1-10. <https://doi.org/10.1038/s41572-025-00631-4>
- Stabilini C, Van Veenendaal N, Aasvang E, Agresta F, Aufenacker T, Berrevoet F, et al. Update of the international HerniaSurge guidelines for groin hernia management. *BJS Open*. 2023;7(5):1-38. <https://doi.org/10.1093/bjsopen/zrad080>
- Wang F, Ma B, Ma Q, Liu X. Global, regional, and national burden of inguinal, femoral, and abdominal hernias: a systematic analysis of prevalence, incidence, deaths, and DALYs with projections to 2030. *Int J Surg*. 2024;110(4):1951-1967. <https://doi.org/10.1097/js9.0000000000001071>
- Watkin D, Robertson G. Hernias and abdominal wall. In: Garden OJ, editor. *General Surgical Operations*. 5th ed. Philadelphia: Churchill Livingstone; 2006:75-94.
- Yang XF, Liu JL. Acute incarcerated external abdominal hernia. *Ann Transl Med*. 2014;2(11):1-9.
- Birindelli A, Sartelli M, Di Saverio S, Coccolini F, Ansaloni L, Van Ramshorst GH, et al. 2017 update of the WSES guidelines for emergency repair of complicated abdominal wall hernias. *World J Emerg Surg*. 2017;12:1-16. <https://doi.org/10.1007/s10029-019-02021-8>
- Gossage JA, Burnand KM. The abdominal wall, hernias and the umbilicus. In: Browse's *Introduction to the Symptoms & Signs of Surgical Disease*. Boca Raton (FL): CRC Press; 2021:469-490. <https://doi.org/10.1201/9780429447891-14>
- Baskin BE. Acute abdominal pain. In: Tintinalli's *Emergency Medicine Manual*. 8th ed. New York: McGraw-Hill Education; 2018:1-76.
- Saeter AH, Fonnes S, Rosenberg J, Andresen K. Mortality after emergency versus elective groin hernia repair: a systematic review and meta-analysis. *Surg Endosc*. 2022;36(11):7961-7973. <https://doi.org/10.1007/s00464-022-09327-2>
- Close JF. Gastrointestinal clinical assessment and diagnostic procedures. In: Urden LD, Stacy KM, Lough ME, editors. *Priorities in Critical Care Nursing: E-Book*. 8th ed. St. Louis (MO): Mosby Elsevier; 2019: 364-392.
- Al Jalbout N, Liteplo A, Shokoohi H. Point-of-care ultrasound in stratifying clinically evolving inguinal and femoral hernias. *J Emerg Med*. 2022;63(2):257-264. <https://doi.org/10.1016/j.jemermed.2022.04.034>
- Piga E, Zetner D, Andresen K, Rosenberg J. Imaging modalities for inguinal hernia diagnosis: a systematic review. *Hernia*. 2020;24(5):917-926. <https://doi.org/10.1007/s10029-020-02189-4>
- Hambly P, Sainsbury M. *Perioperative Management for House Surgeons*. Boca Raton (FL): CRC Press; 1996:1-280.
- Farrell MS, Zhang Z, Kirsch J, Bower K, Bower C, Gelbard R, et al. Surgical management of incarcerated and strangulated inguinal hernias requiring urgent surgical intervention: a systematic review, meta-analysis, and practice management guideline from the Eastern Association for the Surgery of Trauma. *J Trauma Acute Care Surg*. 2023;795-803.

15. Lai SD, Smith NJ, Park B, Vandal A, MacCormick AD. Laparoscopic versus open approach for emergency repair of groin hernias: a systematic review and meta-analysis. *World J Surg.* 2025;49(10):2733-2741. <https://doi.org/10.1002/wjs.70076>
16. Hariprasad S, Srinivas T. Clinical study on complicated presentations of groin hernias. *Int J Res Med Sci.* 2017;5(8):3303-3308. <https://doi.org/10.18203/2320-6012.ijrms20173159>
17. Samraj A. A study on groin hernias presenting as acute surgical emergencies in adults. *Int Surg J.* 2017;4(12):1-5. <https://doi.org/10.18203/2349-2902.isj20175098>
18. Fallis LS. Inguinal hernia: a report of 1,600 operations. *Ann Surg.* 1936;104(3):403-412.
19. Rai S, Chandra S, Smile S. A study of the risk of strangulation and obstruction in groin hernias. *ANZ J Surg.* 1998;68(9):650-654. <https://doi.org/10.1111/j.1445-2197.1998.tb04837.x>
20. Akinci M, Ergül Z, Kulah B, Yilmaz KB, Kulacoglu H. Risk factors related with unfavorable outcomes in groin hernia repairs. *Hernia.* 2010;14(5):489-493. <https://doi.org/10.1007/s10029-010-0683-y>
21. Bekoe S. Prospective analysis of the management of incarcerated and strangulated inguinal hernias. *Am J Surg.* 1973;126(5):665-668. [https://doi.org/10.1016/s0002-9610\(73\)80018-2](https://doi.org/10.1016/s0002-9610(73)80018-2)
22. Shah R, Adhikari S, Gautam K. Clinical spectrum of obstructed inguinal hernia and its clinical outcome. *Int Surg J.* 2024;1086-1090. <https://doi.org/10.18203/2349-2902.isj20241735>
23. Kulah B, Kulacoglu IH, Oruc MT, Duzgun AP, Moran M, Ozmen MM, et al. Presentation and outcome of incarcerated external hernias in adults. *Am J Surg.* 2001;181(2):101-104. [https://doi.org/10.1016/s0002-9610\(00\)00563-8](https://doi.org/10.1016/s0002-9610(00)00563-8)